

CHAPTER 9

LIQUID CHEMICAL SOLUTIONS

9-1. GENERAL.

Liquid chemicals are used in swimming pools for three principal functions; disinfection, pH and alkalinity adjustment, and flocculation. Also, diatomaceous earth filter aid is fed as a liquid slurry, but it is not treated in this chapter. For disinfection, by far the most common chemicals are the chlorine sources. For pH and alkalinity control typical chemicals are soda ash, muriatic acid and sodium bisulphate. For flocculation, filter alum is common with soda ash added to provide sufficient alkalinity.

9-2. CHEMICALS.

a. For disinfection by chlorination, solutions of three primary compounds are used: calcium hypochlorite, chlorinated cyanurates, and sodium hypochlorite. The first two are normally dry powders, the third is a liquid. In practical swimming pool operation there are limitations on the strength of each chemical solution prepared.

b. The liquid sodium hypochlorite is typically furnished in concentrations of 15 percent or less. It may be fed diluted or full strength. Solutions of the dry cyanurates or calcium hypochlorite should be prepared according to manufacturers recommendations; suggested solution strengths are typically 2 percent to 5 percent.

9-3. STORAGE.

a. Solution preparation and storage is now simpler because of self-supporting polyethylene and fiberglass tanks. The heavy metal and ceramic tanks are less often used today. In general, it is desirable to use the largest solution reservoir, the weakest solution strength, and the highest chemical feeder output setting which is consistent with the space, personnel, and facilities available. The use of a relatively large solution reservoir permits the use of more dilute solutions which retain strength longer and permit operating the chemical feeder at a higher rate. A large reservoir also increases volumetric efficiency and accuracy, making possible better dispersal of the sanitizing agent in the water.

b. It is good practice to cover solution tanks not only to protect the solution but also to prevent the possible spread of vapors or fumes. Combination tank and feeder assemblies have a cover that serves as a support for the feeder. The feeder may also be located

at the side or below the tank. Solution tanks must be properly maintained to assure accuracy and trouble-free operation of the chemical feed system.

9-4. SOLUTION PREPARATION.

The large solution reservoir makes possible the one-time preparation of a batch that will last a relatively long period. If calcium hypochlorite or other residue chlorines are used to prepare the solution, the two-tank system is recommended. That is, mix one tankful and allow the precipitate or insoluble material to settle before placing the intake of the chemical feeder in the tank. Then, while feed is being taken from the first tank, mix another supply in the second tank and allow to settle. Tanks are then alternated and the insoluble sludge which tends to settle out is cleaned from each tank prior to mixing a new batch. The use of corrosion-resistant plastic drain valves in plastic tanks makes this job easier.

9-5. LIQUID CHLORINE FEEDERS.

The chemical feed unit is composed of an assembly for handling the chemical solution and a mechanism for supplying the energy necessary to inject the chemical solution. The positive displacement type chemical feeder is the type most often used in public swimming pools although other types including drip feeders and venturi or differential pressure feeders are used. Chlorination should occur after the water has left the equipment.

9-6. POSITIVE DISPLACEMENT TYPE FEEDERS.

Most positive displacement type feeders have at least two check valves and a piston or diaphragm which transmits the energy of the drive mechanism to the pumped solution. The check valves must operate properly in order to assure performance of the pump. Although chemical feeder manufacturers have gone to considerable length to design valve systems that will handle comparatively large amounts of dirt and particles, solutions must be kept clean.

9-7. FEEDER FOULING.

A pool operator should expect to see scale developing in a chemical feed system. The rate of development is affected by type of source, solution temperature, feed velocity, and the hardness of the solution makeup

water. The scale can be dissolved by periodically feeding a dilute acid through the entire solution handling assembly of the chemical feed. This is done by placing the solution intake point or foot valve in a small reservoir of dilute muriatic acid or vinegar and operating the pump until the scale is dissolved.

9-8. SETTING FEED RATES.

a. Some chemical feed systems have timers or interrupter mechanisms to control their feed. The pump is operated for a portion of the total filter cycle rather than continuously. This permits the chemical feed system to operate at a higher volume per unit time and thus assure greater volumetric efficiency. That is, greater accuracy is achieved in feeding at a rate of ten gallons per day than feeding at a rate such as 1 quart per day. The technique of interrupted feed, in fact, makes it possible to feed hypochlorites at a maximum possible concentration and reduce the frequency with which the solution reservoir must be refilled. For a 30,000-gallon pool, for instance, it is possible that one filling of a 50-gallon reservoir of sodium hypochlorite will last 2 weeks or more. During this time chlorine would be fed regularly without further attention.

b. All swimming pool chemical feed equipment should incorporate a method for varying the output of the system. Residual tests will indicate if a change in

the output of the system is necessary to maintain the residual. After some experience, the skilled operator anticipates the need for change according to sun conditions, bather load, wind conditions, and other factors requiring either more or less chlorine feed.

9-9. EQUIPMENT SERVICE.

An important, but frequently neglected, consideration is equipment service. Most manufacturers of swimming pool chemical feed equipment service their equipment through local offices, distributors, or service companies.

9-10. SERVICE SCHEDULE.

Most swimming pools have at least a brief shutdown period during the year. Because of the nature of the chemical feed system and its exposure to solutions which are corrosive, may be highly acid or caustic, and may tend to form scale rapidly, it is important that the system receive at least an annual check as part of the pool maintenance routine. This annual check, some modest care in maintaining clean solutions, periodic acid cleanouts to remove scale, and conscientious output adjustments in response to residual tests will make it possible for an operator to have a safe and clean pool at all times.